

FLORAL DIMORPHISM IN *UTRICULARIA JANARTHANAMII*

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The majority of flowering plants produce chasmogamous flowers, which require external agencies like wind, water, or animals for pollination to set fruit. Cleistogamous flowers are reduced flowers that never open and thus show obligate autogamy. Cleistogamous flowers are not uncommon, but chiefly occur in allogamous species, frequently after the conventional allogamous flowers have failed to set seeds. The development of cleistogamous flowers ensures seed is set in the absence of outcrossed seed, but may also produce less-fit offspring. In some plants only cleistogamous flowers are produced, which do not require external agencies for pollination to set fruit. Anderson (1980) reported a bizarre and intriguing way in which these flowers achieve self-fertilization.

Some plants produce both minute cleistogamous flowers and showy chasmogamic flowers on the same plant. Floral dimorphism is well known in many families such as Commelinaceae, Rubiaceae (Maheshwari & Maheshwari 1955), Lentibulariaceae (Taylor 1989) and Malpighiaceae (Koul 2001). Normally chasmogamous and cleistogamous flowers are produced on aerial parts of the plant. However, in some plants chasmogamous flowers are produced above the ground and cleistogamous flowers below the ground (Uphof 1938; Camp & Gilly 1943; Maheshwari 1960). Some members of Malpighiaceae, such as *Aspicarpa*, *Camarea*, *Janusia* and *Gaudichaudia* produce both cleistogamous and chasmogamic flowers on the same individuals, above the ground (Koul 2001). Cleistogamous and/or chasmogamous forms are found in some species of *Utricularia* (Taylor 1989).

The development from biotic to abiotic pollination and further (or directly) to autogamy may be considered as autonomous orthogenesis; but mostly it represents increasing adaptation to adverse conditions. Cleistogamy may either be seasonal, or a phenomenon induced by either inhospitable conditions or by the submersion of a normally emergent inflorescence (or part



Figure 1: *Utricularia janarthanamii*, cleistogamous flower. Scale bar indicates 1 mm. Photograph by S.R. Yadav.

thereof). In short, chasmogamous flowers are produced in favourable season and cleistogamous flowers in unfavourable conditions. Such conditions may be represented by climates in which biotic vectors do not occur in sufficient numbers to ensure pollination, e.g. too dry or too cool climates.

A number of species produce flowers with a much reduced corolla that are self-pollinated without opening. These flowers are smaller than normal flowers and may be a seasonal phenomenon or induced, either by uncongenial conditions or by submersion of a normally emergent inflorescence or part thereof. Such types are described as pseudocleistogamy or ecological cleistogamy (Uphof 1938). In these species, the cleistogamy is conditional and primarily controlled by the environmental factors. Darwin (1877) and Uphof (1934, 1938) are of the opinion that the cleistogamy is an adaptation for self pollination; these flowers represent retarded forms of chasmogamous type. In certain terrestrial species such as *Utricularia subulata* L., *U. juncea* Vahl, *U. longeciliata* A. DC., *U. minutissima* Vahl, *U. pubescens* Sm. and *U. bisquamata* Schrank, chasmogamous flowers are produced in the favourable season while cleistogamous flowers tend to be produced in the autumn.

However Burck (1906) considered that cleistogamy is controlled genetically and suggested that in many species of angiosperms such a condition might have been originated by mutation. This view is further supported by Weatherwax (1929) and Uphof (1934). In certain aquatic species like *Utricularia benjaminiana* Oliver, *U. breviscapa* Wright ex Griseb., *U. trichophylla* Spruce ex Oliver, *U. dimorphantha* Makino, and *U. hydrocarpa* Vahl, the cleistogamous flowers are at the base of chasmogamic inflorescences (Taylor 1989). However sometimes inflorescences are dimorphic (i.e., chasmogamous as well as cleistogamous), as in *Utricularia geniniscapa* Benj. and *U. trichophylla* Spruce ex Oliver. In these aquatic species cleistogamous inflorescences bear one or very rarely two flowers. Cleistogamous inflorescences are practically without peduncles.

	Chasmogamous flowers	Cleistogamous flowers
Flowers	Racemose, long peduncle	Solitary, reduced peduncle
Bracts	1.4-1.5 mm long	0.25-0.30 mm long
Pedicels	4-8 mm long	Almost absent
Upper calyx lobes	1.8-2 × 1-1.2 mm; 1.9-2.2 × 1.2-1.4 mm in fruit	0.55-0.6 × 0.4-0.5 mm; 0.8-0.9 × 0.6-0.7 mm in fruit
Lower calyx lobes	2-2.2 × 1.2-1.3 mm; 2.5-2.7 × 1.2-1.4 mm in fruit	0.6-0.7 × 0.4-0.45 mm; 0.9-1.1 × 0.5-0.6 mm in fruit
Corolla	Blue to pink	Hyaline
Upper corolla lip	3.2-3.3 × 1-1.1 mm; linear-oblong, crested at centre, rounded or notched at apex	1.2-1.4 × 0.6-0.8 mm; shortly 2-lobed, overlapping lower lip
Lower corolla lip	3-3.2 × 3.8-4.2 mm, obovate, hairy in throat, bigibbous at base, rounded at apex	Shallowly lobed, 1.3-1.5 × 1.5-2 mm, convolute
Spur	2-5 mm long, conical, descending, acute or 2-3 dentate at apex	Almost absent
Stamens	1-1.2 mm long,	0.45-0.5 mm long
Pistil	0.9-1.1 mm long	0.35-0.4 mm long
Capsule	1.8-2 × 1.2-1.3 mm	Capsules: 1.25-1.5 × 0.75-0.8 mm

Table 1: Differences between chasmogamous flowers and cleistogamous flowers of *Utricularia janarthanamii*.

During our survey on flowering plants of Maharashtra State, about 23 species of *Utricularia* were collected (Sardesai *et al.* 2001). On critical analysis, three species turned out to be novelties (Yadav *et al.* 2000, 2005). Of these, *U. janarthanamii* Yadav, Sardesai & Gaikwad exhibits two types of flowers in the same individual. This species grows at an altitude of about 500-600 m on wet grounds, marshy rice fields, and wet grasslands and is known only from the foothills of Western Ghats of Maharashtra. The species flowers from July to April. The rainy season is favourable for vigorous growth. The cleistogamous nature of flowers along with chasmogamous flowers occurs throughout the range of its distribution. The overall dimensions of cleistogamous flowers are much smaller than those of chasmogamous flowers.

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## 7th Conference of the ICPS in 2008!

It gives me great pleasure to announce that the 2008 International Carnivorous Plant Society Conference will be held in Sydney, Australia. The venue chosen is the Royal Botanic Gardens, in the heart of the city, close to many facilities. Since this is the first time this biennial conference has been held in the Southern Hemisphere it was deemed appropriate for it to be held at a time when the carnivorous plants across most of southern Australia would be at their best, and so the conference will be held from the 25nd to the 28th of September. The conference will include a number of lectures and demonstrations, and there will be some optional field trips to the Blue Mountains and Mt Tomah Botanic Gardens, both within 3 hours drive from Sydney. Provisions are also being made for a field trip to see *Cephalotus*, pygmy sundews and tuberous sundews in South Western Australia for conference attendees able to make it to this part of the country during their stay down under. Stay tuned for further details, and please mark the dates in your diaries; we'd love to see you in Sydney in 2008.

Greg Bourke